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Description

Spoonable dairy creams are very well known in Great Britain. They are often used in desserts or with cakes. A couple of parameters that can be used in order to describe the requirements that spoonable creams should fulfil at 5°C are disclosed by P. Sherman in Emulsion Science, Ac. Press 1988, in terms of rheology. Sherman, however, does not disclose the data for these requirements. We have studied the rheology of spoonable NDC's and found that the following criteria should be fulfilled:

- 1) the creams should have an extrapolated yield value of more than 50 Pa between shear rates of 100-300 S⁻¹ (Bingham);
- 2) the creams should have a Bingham viscosity of less than 500 mPa s between shear rates of 100-300 S⁻¹;
- 3) the creams should display failure to stress at a strain of less than 0.5 Radians.

Furthermore, the creams should be stable, i.e. no separation should occur when storing these creams over a relatively long period. It should be noted that failure to stress is defined as that point in the strain curve of an emulsion wherein the storage modulus (G') equals the loss modulus (G''). Although dairy creams are known that are spoonable, the stability of dairy creams is still a problem when using longer storage times. It is also for the purpose of obtaining more healthier products, i.e. products containing more unsaturated or at least fewer saturated fatty acid moieties, that attempts have been made to produce a non-dairy equivalent of the spoonable dairy creams. However, so far any efforts to produce a spoonable non-dairy cream (= NDC), thus one containing non-dairy fats, have been unsuccessful: Either the stability or the rheology of the creams was insufficient.

Therefore, so far no non-dairy equivalent of a spoonable dairy cream was available. From EP 294 119 artificial creams are known, wherein the creams comprise water-continuous fat emulsions with a fat content of 15-50 wt%. In order to achieve the desired mouthfeel the fat must have a specific N-line, i.e. $N_{35} \leq 5$; $N_{25} \geq 5$ and $N_{15}:N_{25} \geq 1.5$. Therefore, nothing can be derived from this reference about the criteria for a spoonable cream, nor about how to meet these criteria.

We have now found a solution to the problems mentioned above. Therefore, our invention is concerned in the first place with water-continuous, non-dairy creams that contain emulsifiers and 20-50 wt.% of fat, and optionally thickeners, which NDC's are characterized in that they are stable and spoonable. In this respect, the term stable is defined as: the cream can be stored for at least 14 days at a temperature of 1-15°C without the consumer noticing any chemical and/or physical changes. The term spoonable is defined here in accordance with the definition of spoonable given above and should be considered as being incorporated in above invention.

Suitable spoonable NDC's display a firmness, measured as Stevens value, of 10-500 g. Stevens value can be measured with an LFRA-Stevens texture analyzer, using a cylindrical measuring rod having a diameter of 2.5 cm, a height of 3.5 cm and a weight of 20.9 g and 0.4 mm penetration depth.

The fats that can be used in our NDC's are all vegetable fats. Preferred fats are, however, palmkernel oil, soybean oil, rapeseed oil, coconut oil, sunflower oil, safflower oil and/or fully or partially hardened fractions thereof. The fat compositions can also contain butterfat; in general, 0-40 wt.%, preferably 20-30 wt.% of the total fat can consist of butterfat.

The most preferred fat mixtures consist of a mixture of sunflower oil and hardened soybean oil, preferably in a weight ratio of 3-5 sunflower oil to 1 partially hardened soybean oil, and of a mixture of hardened palmkernel oil, coconut oil and butterfat, preferably in a weight ratio of 1-3 palmkernel oil to 1-3 coconut oil to 1 butterfat.

In order to obtain stable, spoonable NDC's, it is important to use an emulsifier. Emulsifiers that give the best results are monoglyceride esters of saturated fatty acids, in particular those derived from fatty acids having 16-18 C-atoms (= Hymono's). Tweens, i.e. polyoxyethylene sorbitan fatty acid esters, however, also lead to good results.

The emulsifiers are present in amounts of 0.05-0.8 wt.%, preferably 0.1-0.5 wt.%.

Thickeners can also be present in our NDC compositions. Although all known types of thickeners can be used, e.g. locust bean gum, guar gum, alginate, carrageenan, microcrystalline cellulose, we prefer to use guar gum. The amount of thickener is normally between 0.01 and 0.5 wt.%, preferably 0.05-0.3 wt.%.

The taste of NDC is rather flat. In order to improve the taste and to give it a dairy impression, 1-10 wt.%, preferably 5-8 wt.% of a milk protein source such as skimmed milk powder, sodium caseinate, a whey powder concentrate or, preferably, buttermilk powder (BMP) can be added to the water phase of the NDC. The presence of these amounts of buttermilk powder in the NDC's does not influence the other, required properties of our NDC's in an unacceptable way.

The invention is further concerned with a process for the production of spoonable, stable NDC's. This process comprises the following steps:

- making a pre-mix of the fats, emulsifier, thickener and water and optionally buttermilk powder;
 - heating the pre-mix to 70-80°C;
 - sterilizing the heated pre-mix by UHT treatment, i.e. by introducing steam of 130-160°C for 1-30 seconds;
 - cooling the sterilized pre-mix to 40-60°C;
 - homogenizing the cooled pre-mix under pressure, either in a single stage or in a multi-stage process.
Pressures that can be applied range from 50-250 bar, preferably 150-225 bar;
 - cooling the homogenized mixture to 25-40°C;
 - filling a container, e.g. a tetrapack, with the cooled, homogenized, spoonable NDC at 25-40°C.
- The filled containers should be further cooled to 5°C in the warehouse.
In this way NDC's are obtained that are spoonable and stable for relatively long periods of time.

EXAMPLE I

A pre-mix was made of the components mentioned in Table I.

TABLE I

<u>Component</u>	<u>amount in wt. %</u>
Hardened palmkernel oil	13.5
Coconut oil	13.5
Butter	7.5
Hymono (C ₁₆ /C ₁₈ monoglycerides)	0.2
BMP (Butter Milk Powder)	7.0
Thickener	0.07
Water	balance to 100%

This pre-mix was heated to 80°C, sterilized by steam injection (150°C, 2.5 sec.) and cooled to 50°C. The water-continuous emulsion was now pressurized in a single stage, using a pressure of 200 bar. After the pressurization, the NDC was cooled to 40°C, after which it was packed at the same temperature in a tetrapack and stored at 5°C.

The Stevens value of this NDC at 5°C was 40 g. The NDC was eminently spoonable. The NDC was stable for at least 21 days.

EXAMPLE II

The procedure of Example I was repeated, but using the composition of Table II.

TABLE II

<u>Component</u>	<u>amount in wt. %</u>
Sunflower oil	24
Hardened soybean oil m.p. 44°C	6
Hymono	0.2
BMP	7.0
Thickener	0.07
Water	balance to 100%

The composition was stable for at least 21 days, while the Stevens value was 30 g.

EXAMPLE III

The process was repeated with a composition according to Example I, the only exception being that the Hymono was replaced by 0.35 wt.% of Tween-60 (= polyoxyethylene sorbitan fatty acid esters).

After filling, the product was slowly cooled to 5°C, resulting in a spoonable product.

Claims

1. A water-continuous non-dairy cream (NDC) having emulsifier(s) and 20-50 wt.% of fat, and optionally thickener, characterized in that the NDC is stable and has a spoonable rheology so that the cream displays at 5°C :
 - 1) an extrapolated yield value of more than 50 Pa between shear rates of 100-300 S⁻¹ (Bingham);
 - 2) a Bingham viscosity of less than 500 mPa s between shear rates of 100-300 S⁻¹;
 - 3) failure to stress at a strain of less than 0.5 Radians.
2. NDC according to Claim 1, wherein the NDC displays a Stevens value of 10-500 g.
3. NDC according to Claims 1-2, wherein the fat is a saturated and/or unsaturated, vegetable fat.
4. NDC according to Claim 3, wherein the fat is at least one of the group consisting of palmkernel oil, soybean oil, rapeseed oil, coconut oil, sunflower oil, safflower oil, butterfat or fully or partially hardened fractions thereof.
5. NDC according to Claim 4, wherein the fat is a mixture of sunflower oil and partially hardened soybean oil.
6. NDC according to Claim 4, wherein the fat is a mixture of hardened palmkernel oil, coconut oil and butterfat.
7. NDC according to Claim 1, wherein the emulsifier is a saturated monoglycerol ester.
8. NDC according to Claim 1, wherein the emulsifier is present in an amount of 0.05-0.8 wt. %.
9. NDC according to Claim 1, wherein the thickener is guar gum.
10. NDC according to Claim 1, wherein the amount of thickener is 0.01-0.5 wt. %.
11. NDC according to Claim 1, wherein also 1-10 wt. % of a milk protein source, preferably buttermilk powder, is present.
12. Process for the preparation of a spoonable, stable NDC with the composition according to claims 1-11 comprising the steps of
 - making a pre-mix of fats, emulsifier, thickener and water and optionally buttermilk powder;
 - heating the pre-mix to 70-90°C;
 - sterilizing the heated pre-mix by injection of steam of 130-160°C for 1-30 seconds;
 - cooling the sterilized pre-mix to 40-60°C;
 - homogenizing the cooled pre-mix under pressure; cooling the homogenized mixture to 25-40°C;
 - filling a container with the cooled, homogenized, spoonable NDC at 25-40°C.
13. Process according to Claim 12, wherein the pressure, applied in the homogenization step, is 50-250 bar.

Patentansprüche

1. Wasserkontinuierliche nichtmilchhaltige bzw. Nichtmolkereisahne (NMS) mit einem oder mehreren Emulgator(en) und 20 bis 50 Gew.-% Fett sowie fakultativ einem Verdickungsmittel, dadurch gekennzeichnet, daß die NMS stabil ist und eine mit dem Löffel eßbare Rheologie aufweist, so daß die Sahne bei 5°C
 - 1) einen extrapolierten Fließwert von mehr als 50 Pa zwischen Schergeschwindigkeiten von 100 bis 300 s⁻¹ (Bingham),

- 2) eine Bingham-Viskosität von weniger als 500 mPa.s zwischen Schergeschwindigkeiten von 100 bis 300 s⁻¹ und
 3) ein Versagen unter Spannung bei einer Beanspruchung von weniger als 0,5 Radiant zeigt.

- 5 2. NMS nach Anspruch 1, in der die NMS einen Stevens-Wert von 10 bis 500 g zeigt.
3. NMS nach den Ansprüchen 1 bis 2, in der das Fett ein gesättigtes und/oder ungesättigtes pflanzliches Fett ist.
- 10 4. NMS nach Anspruch 3, in der das Fett mindestens eines aus der aus Palmkernöl, Sojaöl, Rapsöl, Kokosnußöl, Sonnenblumenöl, Saffloröl, Butterfett oder völlig oder partiell gehärteten Fraktionen davon bestehenden Gruppe ist.
- 15 5. NMS nach Anspruch 4, in der das Fett eine Mischung aus Sonnenblumenöl und partiell gehärtetem Sojaöl ist.
6. NMS nach Anspruch 4, in der das Fett eine Mischung aus gehärtetem Palmkernöl, Kokosnußöl und Butterfett ist.
- 20 7. NMS nach Anspruch 1, in der der Emulgator ein gesättigter Monoglycerolester ist.
8. NMS nach Anspruch 1, in der der Emulgator in einer Menge von 0,05 bis 0,8 Gew.-% vorliegt.
9. NMS nach Anspruch 1, in der das Verdickungsmittel Guargummi ist.
- 25 10. NMS nach Anspruch 1, in der die Verdickungsmittelmenge 0,01 bis 0,5 Gew.-% beträgt.
11. NMS nach Anspruch 1, in der auch 1 bis 10 Gew.-% einer Milchproteinquelle, vorzugsweise Buttermilchpulver, vorliegen.
- 30 12. Verfahren zur Herstellung einer mit einem Löffel eßbaren, stabilen NMS der Zusammensetzung gemäß den Ansprüchen 1 bis 11, das die Schritte umfaßt:
- Herstellen einer Vormischung aus Fetten, Emulgator, Verdickungsmittel und Wasser und fakultativ Buttermilchpulver;
 - Erhitzen der Vormischung auf 70 bis 90°C,
 - 35 - Sterilisieren der erhitzten Vormischung durch Einführen von Wasserdampf von 130 bis 160°C für 1 bis 30 s;
 - Abkühlen der sterilisierten Vormischung auf 40 bis 60°C,
 - Homogenisieren der abgekühlten Vormischung unter Druck,
 - Abkühlen der homogenisierten Mischung auf 25 bis 40°C,
 - 40 - Füllen eines Behälters mit der abgekühlten, homogenisierten, mit dem Löffel eßbaren NMS bei 25 bis 40°C.
13. Verfahren nach Anspruch 12, bei dem der im Homogenisierungsschritt angewendete Druck 50 bis 250 bar beträgt.
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Revendications

- 50 1. Crème non laitière à phase aqueuse continue (CNL) contenant un ou plusieurs émulsifiant(s) et de 20 à 50% en poids de graisse ainsi que facultativement un épaississant, caractérisée en ce qu'elle est stable et présente une rhéologie à la cuillère de sorte qu'à 5°C, la crème possède les propriétés suivantes :
- 1) rendement extrapolé de plus de 50 Pa entre les taux de cisaillement de 100 et 300 s⁻¹(Bingham) ;
 - 2) une viscosité Bingham de moins de 500 mPa.s entre les taux de cisaillement de 100 et 300 s⁻¹ ;
 - 3) une absence de contrainte à une déformation inférieure à 0,5 radian.
- 55 2. CNL selon la revendication 1, qui présente un indice Stevens de 10 à 500 g.
3. CNL selon les revendications 1 et 2, dont la graisse est une graisse végétale saturée et/ou insaturée.

4. CNL selon la revendication 3, dans laquelle la graisse est au moins l'une des suivantes : huile de coeur de palmier, huile de soja, huile de colza, huile de coprah, huile de tournesol, huile de carthame, graisse de beurre ou des fractions entièrement ou partiellement durcies de celles-ci.
5. CNL selon la revendication 4, dans laquelle la graisse est un mélange d'huile de tournesol et d'huile de soja partiellement durcie.
6. CNL selon la revendication 4, dans laquelle la graisse est un mélange d'huile de coeur de palmier durcie, d'huile de coprah et de graisse de beurre.
7. CNL selon la revendication 1, dans laquelle l'émulsifiant est un ester saturé de monoglycérol.
8. CNL selon la revendication 1, dans laquelle l'émulsifiant est présent à raison de 0,05 à 0,8% en poids.
9. CNL selon la revendication 1, dans laquelle l'épaississant est la gomme de guar.
10. CNL selon la revendication 1, dans laquelle la quantité d'épaississant est de 0,01 à 0,5% en poids.
11. CNL selon la revendication 1, dans laquelle on incorpore également de 1 à 10% en poids d'une source de protéine de lait, de préférence une poudre de babeurre.
12. Procédé de préparation d'une CNL stable pouvant être consommée à la cuillère dont la composition est décrite dans les revendications 1 à 11, qui consiste :
 - à préparer un prémélange de graisse, émulsifiant, épaississant et eau et, facultativement, le babeurre en poudre ;
 - à chauffer le prémélange à 70-90°C ;
 - à stériliser le prémélange chauffé par injection de vapeur d'eau à 130-160°C pendant 1 à 30 secondes ;
 - à refroidir le prémélange stérilisé à 40-60°C ;
 - à homogénéiser le prémélange refroidi sous pression et à refroidir le mélange homogénéisé à 25-40°C ;
 - à remplir un récipient avec la CNL refroidie, homogénéisée et pouvant être consommée à la cuillère, à 25-40°C.
13. Procédé selon la revendication 12, dans lequel la pression appliquée au stade d'homogénéisation est de 50 à 250 bars.